Funding Roadway Infrastructure in an Electrified World

RAP Webinar

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Our Presenters

Jim Lazar
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Questions?

Please send questions through the Questions pane
1 Transportation Funding
Areas of Expertise

Clean Transportation
Adoption of electric vehicles and deployment of charging infrastructure

Built Environment
Advancing energy efficiency and renewable resources

Technology Convergence
Interconnecting systems to achieve decarbonization
One simple mission —

DECARBONIZE.

Our vision is a future with sustainable, equitable and resilient transportation, buildings and communities.
U.S. GHG Emissions by Source, 2017

- Transportation: 29%
- Electricity: 28%
- Industry: 22%
- Commercial and Residential: 12%
- Agriculture: 9%
U.S. Transportation Sector GHG Emissions by Source, 2017

- Light-Duty Vehicles: 59%
- Medium- and Heavy-Duty Trucks: 23%
- Aircraft: 9%
- Rail: 4%
- Other: 2%
- Ships and Boats: 3%
The Transportation System

- **Surface transportation**
  - Highways
  - Bridges
  - Public transit
  - Bike/pedestrian facilities

- **Off-road**
- **Rail**
- **Aviation**
- **Maritime**
- **Pipeline**
- **Intermodal connections**

Moving people

Moving goods
Funding vs. Financing

Funding
No repayment required
- Formula funds
- Competitive project funding

Financing
Requires repayment
- Transportation Infrastructure Finance and Innovation Act (TIFIA)
- State Infrastructure Bank (SIB)
- P3 – tolls, concessions
- TIF – Tax increment financing/value capture
## Selected Revenue Sources for Highway Funding (2012)

<table>
<thead>
<tr>
<th>Revenue Type</th>
<th>Federal</th>
<th>State</th>
<th>Local</th>
<th>Percent of Total Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor fuel taxes</td>
<td>66%</td>
<td>31%</td>
<td>2%</td>
<td>29%</td>
</tr>
<tr>
<td>General fund appropriations</td>
<td>14%</td>
<td>6%</td>
<td>47%</td>
<td>20%</td>
</tr>
</tbody>
</table>

Source: BATIC Institute at AASHTO
18.4 cents indexed to construction inflation would be 32.6 cents today and would have resulted in an additional $22 billion/year in the Highway Trust Fund.
State Gas Tax Increases Since 2013
Infrastructure Needs, Funded and Unfunded, 2016-2025

Source: Center on Budget and Policy Priorities, data from American Society of Civil Engineers

GAP: $1 TRILLION
### Transfers to Highway Trust Fund

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>To Highway Account ($ billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>8.0</td>
</tr>
<tr>
<td>2009</td>
<td>7.0</td>
</tr>
<tr>
<td>2010</td>
<td>14.7</td>
</tr>
<tr>
<td>2011</td>
<td>-</td>
</tr>
<tr>
<td>2012</td>
<td>2.4</td>
</tr>
<tr>
<td>2013 (^1/)</td>
<td>5.9</td>
</tr>
<tr>
<td>2014 (^1/)</td>
<td>18.4</td>
</tr>
<tr>
<td>2015</td>
<td>6.1</td>
</tr>
<tr>
<td>2016</td>
<td>52.0</td>
</tr>
<tr>
<td>2017 (^2/)</td>
<td>0.1</td>
</tr>
<tr>
<td>2018 (^2/)</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$114.7</strong></td>
</tr>
</tbody>
</table>

Source: FHWA
<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>345</td>
</tr>
<tr>
<td>2011</td>
<td>17,735</td>
</tr>
<tr>
<td>2012</td>
<td>52,835</td>
</tr>
<tr>
<td>2013</td>
<td>96,702</td>
</tr>
<tr>
<td>2014</td>
<td>118,773</td>
</tr>
<tr>
<td>2015</td>
<td>114,022</td>
</tr>
<tr>
<td>2016</td>
<td>157,112</td>
</tr>
<tr>
<td>2017</td>
<td>194,479</td>
</tr>
<tr>
<td>2018</td>
<td>361,307</td>
</tr>
<tr>
<td>CYTD 2019</td>
<td>110,886</td>
</tr>
<tr>
<td>Total</td>
<td>1,224,196</td>
</tr>
</tbody>
</table>
New EV Fees
Proposed Transportation Efficiency Utility—flow of funds

Electric Vehicle
Users pay System Benefit Charge

Local Electric Utility

DOT

System Improvements

Maintenance & Preservation

Transportation Demand Management

Transportation Efficiency Utility

The remaining funds go to a Transportation Energy Utility (TEU).

Some of the funds generated from the SBC stay with the energy utility.

Most of these funds are used for DOT projects.

Source: VEIC
2 Drivers of Road Costs
Road Cost Allocation Studies

1997 Federal Highway Cost Allocation Study
Final Report
U.S. Department of Transportation
Federal Highway Administration

2017-2019 OREGON HIGHWAY COST ALLOCATION STUDY
Primary Causes of Road Costs

- Width of vehicles
- Weight of vehicles
- Miles driven (VMT)
- Time and location of travel
Weight and Width
Miles Driven (VMT)
Time and Location of Travel
Options for Roadway Taxing
Options for Roadway Taxing

- **Fixed annual fee** ($/year)
  - Adjusted by width and weight
  - Based on battery size
- **Vehicle miles traveled (VMT) fee** ($/mile)
  - Linked to weight and width
- **Direct existing electricity tax** paid by EVs to roadway fund (% adder to fuel)
- **Tax electricity use** by EVs ($/kWh)
Fuel Tax Tracks Weight, Width, and Miles Traveled
Fixed Annual Fee
Example: Washington $175/year

• Does not track weight, width, or miles traveled.
• Could be adjusted to vary by weight and width.
Annual Fee per kWh of Battery Example: $3/kWh/year

- Plug-in Prius
  - 10 kWh; 30 mile range
  - $30/year (+ gas tax)

- 2012 Leaf
  - 24 kWh; 100 mile range
  - $72/year

- 2019 Tesla 3 LR
  - 75 kWh; 270-mile range
  - $225/year
Vehicle Miles Traveled Fee
Example: Oregon  $0.018/mile

• Does not track weight or width
• Intrusive to some
• How to address interstate mileage??
VMT Linked to Weight and Width

5’ wide; 3,000 lb
$0.01/mile

6’ wide; 4,000 lb
$0.015/mile

7’ wide; 6,000 lb
$0.02/mile
Direct Existing Electricity Tax to Motor Vehicle Fund

- Easy to estimate
- About one-third of typical gasoline tax on a per-mile basis
- ICE vehicles do NOT pay for general gov’t

Cost of Electricity

- Price Before Tax
- Tax
Directly Tax Electricity Use by EVs

- Tax level of $0.01 – $0.02/mile = $0.03 - $0.06/kWh
- Up to a 50% surcharge
- Invites evasion without smart charging
- Need off-peak discount > tax
Dumb vs. Smart Electric Rates

**Dumb Rate**
- All Hours: $0.12/kWh

**Smart Rate**
- Off-Peak: $0.05/kWh
- Mid-Peak: $0.10/kWh
- On-Peak: $0.15/kWh
- Critical: $0.75/kWh
# Comparing Alternatives

<table>
<thead>
<tr>
<th>Option</th>
<th>Drivers: Width, Weight, Miles</th>
<th>Administrative Efficiency</th>
<th>Emissions Efficiency</th>
<th>Interstate Cost Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas and diesel tax</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Annual fixed fee</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Annual fee adjusted by width and weight</td>
<td>Medium</td>
<td>High</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>Annual fee based on battery capacity</td>
<td>Medium</td>
<td>High</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>VMT uniform per mile driven</td>
<td>Low</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>VMT adjusted by width and weight</td>
<td>High</td>
<td>Medium</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>Electricity tax—dumb charging and rates</td>
<td>High</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Electricity tax—smart charging and rates</td>
<td>High</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
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Final Thoughts

• The United States has experienced transportation funding shortfalls for decades; EVs are not one of the primary causes of those shortfalls.

• Fair cost recovery should take into account weight, width and miles driven.

• Smart chargers, smart rate design and smart tax design can work together to provide an effective, efficient and equitable solution.

• Transportation system and electric system planning needs to be coordinated.
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